The Mechanic.

MARCH, 1834.

JAMES WATT.

[Concluded.]

In addition to those difficulties which his unrivalled mechanical ingenuity enabled him to surmount, Watt, notwithstanding the merit of his inventions, had to contend for some time with others of a different nature, in his attempts to reduce them to practice. He had no pecuniary resources of his own, and was at first without any friend willing to run the risk of the outlay necessary for an experiment on a sufficiently large scale. At last he applied to Dr. Roebuck, an ingenious and spirited speculator, who had just established the Carron iron works, not far from Glasgow, and held also at this time a lease of the extensive coal-works at Kinneal, the property of the Duke of Hamilton. Dr. Roebuck agreed to advance the requisite funds on having two thirds of the profits made over to him; and upon this Mr. Watt took out his first patent in the beginning of the year 1769. An engine with a cylinder of eighteen inches diameter was soon after erected at Kinneal; and although, as a first experiment, it was necessarily in some respects of defective construction, its working completely demonstrated the great value of Watt's improvements. But Dr. Roebuck, whose undertakings were very numerous and various, in no long time after forming this connection, found himself involved in such pecuniary difficulties, as to put it out of his power to make any farther advances in prosecution of its object. On this Watt employed himself for some years almost entirely to the ordinary work of his profession as a civil engineer; but at last, about the year 1774, when all hopes of any farther assistance from Dr. Roebuck were at an end, he resolved to close with a proposal which had been made to him through his friend Dr. Small, of Birmingham, that

he should remove to that town, and enter into partnership with the eminent hardware manufacturer, Mr. Boulton, whose extensive establishments at Soho had already become famous over Europe, and procured for England an unrivalled reputation for the arts there carried on. Accordingly, an arrangement having been made with Dr. Roebuck, by which his share of the patent was transferred to Mr. Boulton, the firm of Boulton and Watt commenced the business of making steam-engines in the year 1775.

Mr. Watt now obtained from Parliament an extension of his patent for twenty five years from this date, in consideration of the acknowledged national importance of his inventions. The first thing which he and his partner did, was to erect an engine at Soho, which they invited all persons interested in such machines to inspect. They then proposed to erect similar engines wherever required, on the very liberal principle of receiving as payment for each, only one-third of the saving in fuel which it should effect as compared with one of the old construction. As this saving, however, had been found to amount in the whole to fully three fourths of all the fuel that had been wont to be employed, the revenue thus accruing to the patentees became very great after their engines were extensively adopted. This they very soon were, especially in Cornwall, where the numerous mines afforded a vast field for the employment of the new power, partly in continuing or commencing works which only an economized expenditure could make profitable, and often also in labors which the old engine was altogether inadequate to attempt.

But the draining of mines was only one of many applications of the steam-power now at his command which Watt contemplated, and in course of time accomplished. During the whole twenty-five years, indeed, over which his renewed patent extended, the perfecting of his invention was his chief occupation; and notwithstanding a delicate state of health, and the depressing affliction of severe head-aches, to which he was extremely subject, he continued throughout this period to persevere with unwearied diligence in adding new improvements to the mechanism of the engine, and devising the means of applying it to new purposes of usefulness. He devoted, in particular, the exertions of many years to the contriving of the best methods of making the action of the piston communicate a rotatory motion in various circumstances; and between the years 1781 and 1785, he took out four different patents for inventions having this object in view. In the midst of these scientific labors,

too, his attention was much distracted by attempts which were made in several quarters to pirate his improvements, and the consequent necessity of defending his rights in a series of actions, which, notwithstanding successive verdicts in his favor, did not terminate till the year 1799, when the validity of his claims was finally confirmed by the unanimous decision of the Judges of the Court of King's Bench.

Watt's inexhaustible ingenuity displayed itself in various other contrivances beside those which make part of his steam-engine. An apparatus for copying letters and other writings, now in extensive use; a method of heating houses by steam; a new composition, for the purposes of sculpture, having the transparency and nearly the hardness of marble; a machine for multiplying copies of busts and other performances in carving or statuary,—are enumerated among his minor inventions. But it is his steam-engine that forms the great monument of his genius, and that has conferred upon his name its imperishable renown. This invention has already gone far to revolutionize the whole domain of human industry; and almost every year is adding to its power and its conquests. In our manufactures, our arts, our commerce, our social accommodations, it is constantly achieving what, little more than half a century ago, would have been accounted miracles and impossibilities. 'The trunk of an elephant, it has been finely and truly said, that can pick up a pin, or rend an oak, is as nothing to it. It can engrave a seal, and crush masses of obdurate metal like wax before it,—draw out, without breaking, a thread as fine as gossamer,—and lift a ship of war like a bauble in the air. It can embroider muslin and forge anchors; cut steel into ribands, and impel loaded vessels against the fury of the winds and waves.' And another application of it, which has been made only within the last few months, is perhaps destined to be productive of still greater changes on the condition of society than have resulted from any of its previous achievements. It had been employed, several years ago, at some of our collieries, in the propelling of heavily loaded carriages over railways; but the great experiment of the Liverpool and Manchester Railway has, for the first time, practically demonstrated with what hitherto almost undreamt-of *rapidity* travelling by land may hereafter be carried on through the aid of steam. Coaches, under the impetus communicated by this, the most potent, and at the same time the most perfectly controllable of all our mechanical agencies, have already been

drawn forward at the flying speed of thirty and thirty-five miles an hour. If so much has been done already, it would be rash to conclude that even this is to be our ultimate limit of attainment. In navigation, the resistance of the water, which increases rapidly as the force opposed to it increases, very soon sets bounds to the rate at which even the power of steam can impel a vessel forward. But, on land, the thin medium of the air presents no such insurmountable obstacle to a force making its way through it; and a rapidity of movement may perhaps be eventually attained here, which is to us even as yet inconceivable. But even when the rate of land travelling already shown to be quite practicable shall have become universal, in what a new state of society shall we find ourselves! When we shall be able to travel a hundred miles in any direction in six or eight hours, into what comparative neighborhood will the remotest extremes, even of a large country be brought, and how little shall we think of what we now call distance! A nation will then indeed be a community; and all the benefits of the highest civilization, instead of being confined to one central spot, will be diffused equally over the land, like the light of heaven. This improvement, in short, when fully consummated, will confer upon man nearly as much new power and new enjoyment as if he were actually endowed with wings.

It is gratifying to reflect that even while he was yet alive, Watt received from the voice of the most illustrious of his contemporaries the honors due to his genius. In 1785, he was elected a Fellow of the Royal Society; the degree of Doctor of Laws was conferred upon him by the University of Glasgow in 1806; and in 1808 he was elected a member of the French Institute. He died on the 25th of August, 1819, in the 84th year of his age.

We cannot better conclude our sketch of the life of this great inventor than by the following extract from the character that has been drawn of him by the eloquent writer (Mr. Jeffrey) whom we have already quoted. 'Independently of his great attainments in mechanics, Mr. Watt was an extraordinary, and in many respects a wonderful man. Perhaps no individual in his age possessed so much and such varied and exact information,—had read so much, or remembered what he had read so accurately and well. He had infinite quickness of apprehension, a prodigious memory, and a certain rectifying and methodizing power of understanding, which extracted something precious out of

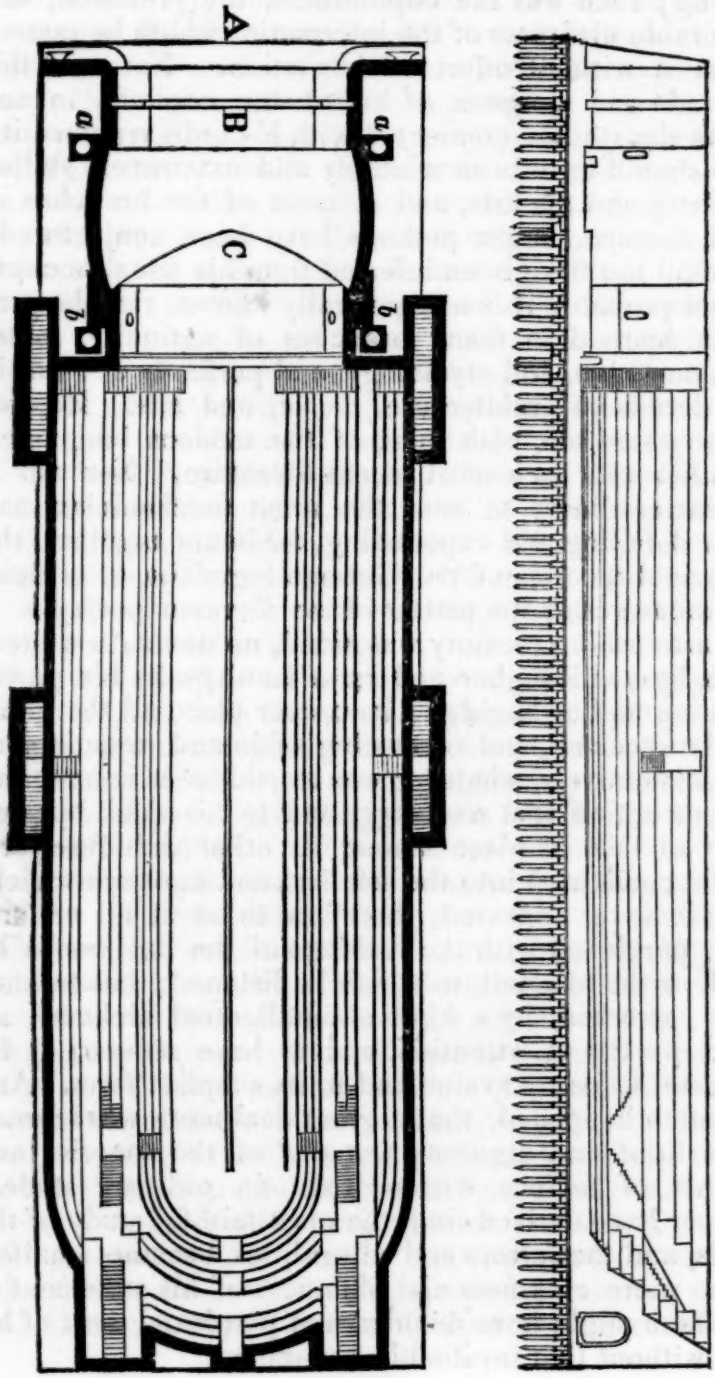
all that was presented to it. His stores of miscellaneous knowledge were immense, and yet less astonishing than the command he had at all times over them. It seemed as if every subject that was casually started in conversation had been that which he had been last occupied in studying and exhausting; such was the copiousness, the precision, and the admirable clearness of the information which he poured out upon it without effort or hesitation. Nor was this promptitude and compass of knowledge confined in any degree to the studies connected with his ordinary pursuits. That he should have been minutely and extensively skilled in chemistry and the arts, and in most of the branches of physical science, might perhaps have been conjectured; but it could not have been inferred from his usual occupations, and probably it is not generally known, that he was curiously learned in many branches of antiquity, metaphysics, medicine, and etymology, and perfectly at home in all the details of architecture, music, and law. He was well acquainted too, with most of the modern languages, and familiar with their most recent literature. Nor was it at all extraordinary to hear the great mechanician and engineer detailing and expounding, for hours together, the metaphysical theories of the German logicians, or criticising the measures or the matter of the German poetry.

'His astonishing memory was aided, no doubt, in a great measure, by a still higher and rarer faculty—by his power of digesting and arranging in its proper place all the information he received, and of casting aside and rejecting, as it were instinctively, whatever was worthless or immaterial. Every conception that was suggested to his mind seemed instantly to take its place among its other rich furniture, and to be condensed into the smallest and most convenient form. He never appeared, therefore, to be at all encumbered or perplexed with the *verbiage* of the dull books he perused, or the idle talk to which he listened; but to have at once extracted, by a kind of intellectual alchemy, all that was worthy of attention, and to have reduced it for his own use to its true value and to its simplest form. And thus it often happened, that a great deal more was learned from his brief and vigorous account of the theories and arguments of tedious writers, than an ordinary student could ever have derived from the most faithful study of the originals, and that errors and absurdities became manifest from the mere clearness and plainness of his statement of them, which might have deluded and perplexed most of his hearers without that invaluable assistance.'

[Compiled for the Mechanic.]

DRY DOCK AT CHARLESTOWN,

WITH A DESCRIPTION OF SOME OF THE MACHINES USED IN ITS CONSTRUCTION.



REFERENCES.—A, is the entrance to the dock; B, is the floating gate, and C the turning gates. *aa*, shows the situation of the capstans for opening the turning gates, and *bb*, the situation of the capstans for shutting them.

After the Engineer, Col. Loammi Baldwin, had formed his plans, and the necessary preparations had been made, the work was commenced under the superintendence of Capt. Alexander Parris, who was assisted by the late Edward Battles, a mechanic, whose industry and perseverance are seldom equalled. A *coffer dam* was first built, in the front of the old battery, in the Navy Yard at Charlestown, extending beyond low water mark, consisting of two rows of *sheet piles* from eight to thirteen feet apart; (the intermediate space being filled with earth;) designed to resist effectually the pressure of the tide, during the building of the dock. Connected with the dam in front, and for the same purpose, about six hundred feet of *quay wall*, with an embankment, were built, principally on the north-east side of the dock, the earth for the embankment being taken partly from the subsequent excavation.

About the last of May, 1828, the excavation was commenced, and at the same time the carpenters commenced preparing the sheet piles, planks, and other timber work, for the foundation of the dock; and the stone-cutters commenced hewing the stone for its formation. About three hundred men were employed on the work, when the weather admitted. A steam-engine of fifteen horse power, on the pendulum principle, built by Mr. E. A. Lester of this city, was put in operation previous to beginning the excavation, for the purpose of keeping it clear of water, whether from rain, leakage of the coffer dam, &c., or from springs. On the 21st of May, 1829, the first stone was laid, while at the same time the excavation at the upper end was going on, as well as the intermediate work preparatory to laying the stone.

The foundation is composed of piles, three feet apart, driven to the average depth of ten feet, on which rest timbers one foot square; the spaces between them being filled with broken stone, which is also rammed under the timbers to an average depth of eight inches. An additional row of piles is driven in the direction of the axis of the dock, and under the keel to the distance of two hundred feet. Upon the timbers is laid a course of three inch plank, well secured with spikes and tree-nails, and another course of timbers directly over the piles; and the space between the timbers is filled with brick, laid in water-proof cement. On this is another course of plank like the first, and secured in like manner, on which the stone work of the dock rests.

This commences at the depth of thirty-two feet below ordinary high water, rising four feet above it, and covers an area of one hundred feet wide, and three hundred and forty one feet long, as enumerated in the following schedule.

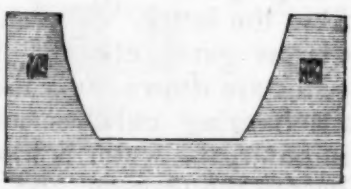
	feet.	inch.
From the sea to beginning of curved walls of entrance,	5	9
Thence to beginning of recesses for turning gates,	21	3
To point of mitre sill,	21	8
To line of heel posts of turning gates,	14	0
To gutter, (the bottom and side walls being curved,)	18	0
To the face of return walls at the foot of dock,	4	0
To centre of semi-circular head of dock,	206	0
To head of dock within the coping, being the radius of the head,	43	0
To extreme end of backing at head,	7	3
	340	11

Round the whole exterior boundary of the floor runs a line of sheet piling, to prevent, as far as possible, the passage of water under the floor, and to stop its admission between the two courses of floor plank. Under the gates, and crossing the dock, are similar lines of sheet piles connected with those on the sides, and well secured to additional cross sills and timbers.

The general interior structure of the dock is this:—The stone floor is thirty feet wide between the first *altars;* and at the lower end, at the discharging gutter, the whole masonry is four feet deep on the floor. From this end, the ascent to the centre of the semi-circular head is one foot three inches in a distance of two hundred and six feet, and in the middle of the floor, and under the blocks on which the keel of the vessel is to rest, runs a gutter, one foot wide, for leading the water to the discharging gutter. From the bottom of the dock on each side, rise *altars*, from one to four feet high, and from two to four wide, and ascending to the top of the dock, running throughout the whole extent of the chamber, (except where interrupted by stairs and slips,) giving a depth of thirty-two feet from the *coping* to the floor of the dock, and eighty-six feet interior width, between the faces of the coping. The semi-circular head is formed with altars having rises and breadths corresponding to those on the sides. There are six flights of steps for entrance to the chamber, and five sets of slips for timber.

The side walls and bottom of that part of the entrance between the foot of the chamber of the dock, and the turning gate posts, have a curvilinear form. The turning gates are each thirty feet ten inches high, about thirty-six feet wide, and two feet thick, snd are curved with a radius of

about seventy feet. Capstans are placed in convenient positions for opening and closing the gates. From the heel posts to the end of the gate recesses, the walls have a horizontal curvature, conformable to that of the gates. In this space, the mitre sill, against which the gates shut, and the floor over which they swing, are horizontal; the former being one foot six inches higher than the latter, and thirty feet below the top of the dock. The side walls of that part of the entrance, beginning at five feet nine inches from the sea, and extending to the recesses of the gates, are partly curved. The floor between the bottom of the interior faces of these side walls is horizontal, and is thirty feet below the top of the dock. In these side walls and bottom, is cut a groove of two feet wide and fifteen inches deep, to receive the *floating gate*, to be used in case the turning gates should require repairs, or to relieve the strain on them by dividing the pressure. The floating gate is made hollow, and rises or sinks, according to the quantity of water it contains.



The length of it being less at the bottom than at the top, and the walls of the same form, when the gate rises about six feet, it is freed from the grooves and can be floated away, which may be readily understood by the annexed cross section of that part of the dock.

The discharging gutter at the foot of the chamber of the dock, is continued through the masonry of the return walls, on each side, in *arched culverts* two feet wide and five feet high, extending forty feet from the axis of the dock. Here the water is discharged into *side* culverts, two feet six inches wide and four feet high, arched at top and bottom, extending about two hundred and fifty feet to a *reservoir* constructed in the masonry under the head of the dock. Into this reservoir the water is drained by the gutters and side culverts, to be afterwards lifted by pumps, worked by the steam-engine.

Along the backing masonry of the side walls of the entrance are constructed two *filling* culverts, one on each side, two feet six inches wide and of the same height, and twelve feet below the top of the coping. They will open from the tide water, in the exterior face of the wing walls, and extend eighty-four feet to square *well rooms*, constructed near the beginning of the discharging culverts.

All the faces of the interior masonry of the floor and altars, the faces of the entrance and wing walls, and at bottom of the entrance, are of hammered stone work, laid in water proof cement. The bottom courses of masonry, over the whole floor, about one foot six inches in depth, as well as one foot six inches in thickness around the whole exterior backing of the dock and entrance, is also laid in cement. In all such parts of the masonry of the dock, where it has been deemed desirable, the courses of stone are so arranged as to form arches, to resist the upward pressure.

The whole stone work in the dock, amounts to about five hundred thousand cubic feet. It was quarried at Quincy, and furnished by contract. The stone was brought on the railway to the landing on Neponset River, and thence transported to the Navy Yard in steam tow-boats.

When a ship is to be docked, the filling culverts are closed, as well as the passages from the dock to the discharging culverts and reservoir, and the water is pumped from the latter. The ship is then admitted, and the ponderous gates closed. In this situation, the discharging gates are drawn, and the water allowed to flow into the discharging culverts and reservoir, and thus, in a few minutes, the water is lowered several inches in the dock, to hasten the shoring, and produce an immediate pressure on the gates, so as effectually to prevent the admission of water, and fix them steadily. The reservoir and culverts will contain above seventeen thousand cubic feet of water: the water in the dock, &c., supposed level with the top of the upper altar, or four feet below the coping, at one foot in depth, will be a little more than twenty one thousand feet; and of this quantity, a ship of the line, admitted at full draught, would displace above nine thousand cubic feet: consequently, to reduce the water one foot when the ship is in the dock, only twelve thousand feet need be admitted to the reservoir and culverts; and the dock water may be lowered about one foot five inches to fill them. A complete command of the level, at the moment when a ship, especially a large one, is about to touch the blocks and to require the placing of shores, seems very important; and this mode will give a more perfect control of the operation, for the first foot, than could be obtained by the best regulated pumps or machinery.

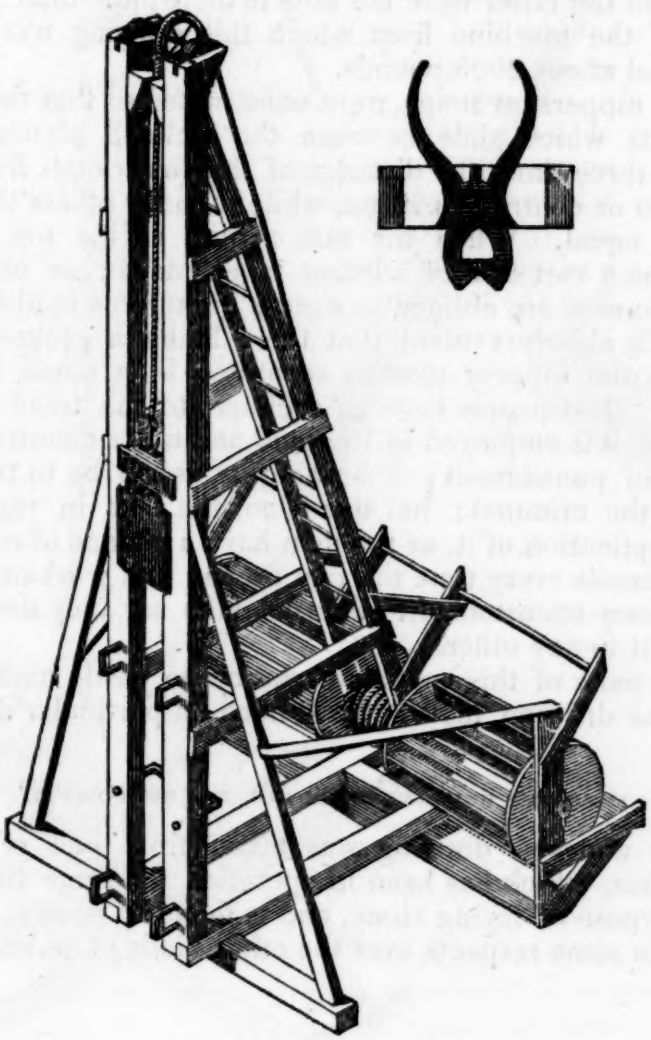
The water is afterwards to be pumped out by the steam engine, near the head of the dock. As the water is

lowered, the ship is propped up by shores, and is then ready to undergo repairs, which can be conducted with great facility and security.

The pumping machinery consists of 8 *lifting pumps* of 2 feet 6 inches in diameter, and 8 *chain pumps* of about 13½ inches in diameter, and equal to 1 foot in area; which are put in operation by a steam engine of 60 horse power.*

The whole was completed and the first trial made, on the 13th of June, 1832, and the Frigate Constitution was admitted, to be repaired, early on the morning of June 24th, 1833, in the presence of the Secretary of the Navy, Com. Hull, and several other gentlemen, and heads of the Departments of Government.

PILE DRIVING MACHINE.



* We propose to describe the *pumps* in a future number.

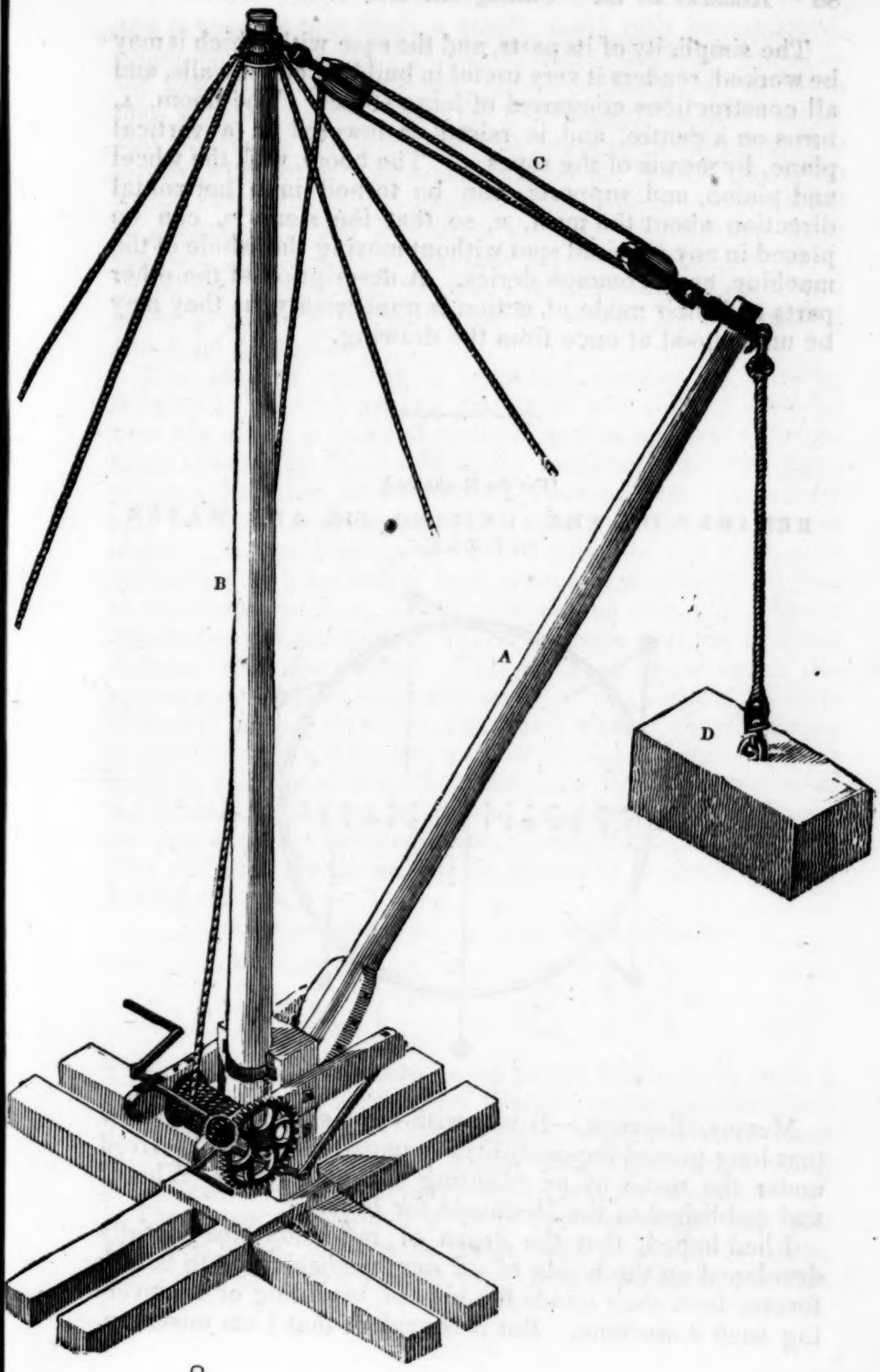
This is an application of the tread wheel instead of the crank. Something similar to it, was first used at the building of the Boston and Roxbury Milldam, about the year 1819; but this method of applying the power of men, for driving piles, was discontinued, until within five or six years, when it was again brought into use. There were four or five of these machines in operation at the Dry Dock, Charlestown Navy Yard. It is found that eight men on the wheel, with one overseer, whose duty it is to keep the pile in a perpendicular direction during a few of the first blows of the ram, will do one third more work than the same number can on one of the best constructed machines with a crank; that is to say, those on the former have arranged nearly 14 piles of 8 to 12 feet in length in a day, while those on the latter were not able to drive more than 9. The ram of the machine from which this drawing was taken, weighed about 2005 pounds.

The nippers, or tongs, were constructed so that the arms, or parts which slide between the inclined planes, were nearly three times the distance of the lower ends from the fulcrum or centre of motion, while in many others they are nearly equal. When the ram arrives at the top of the machine a vast deal of friction takes place; so much so, that the men are obliged to exert a great force to disengage it. It is clearly evident that there being a greater lever power, the nippers may be separated by a much smaller force. Most people have an aversion to the tread wheel, because it is employed in England and other countries as a mode of punishment; imagining its use to be to tire and weary the criminal; but this is not the case in regard to this application of it, as the men have a chance of resting a few seconds every time the ram drops; and workmen who have been accustomed to this machine say they decidedly prefer it to any other.

The parts of this machine may be so easily understood from the drawing, that they will need no particular description.

IMPROVED HOISTING MACHINE, OR 'BOOM DERIC.'

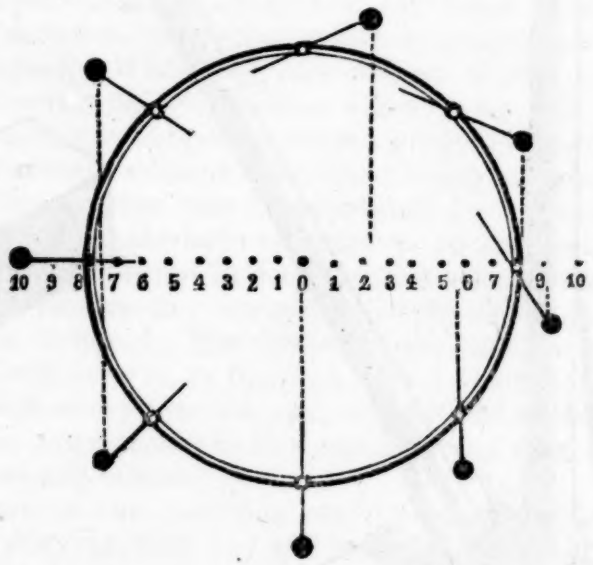
The annexed drawing was taken from one of these machines, which has been in operation for some time, for the purpose of laying stone, and is found to possess advantages in some respects over the other kinds of derics.


C
B
A
D

The simplicity of its parts, and the ease with which it may be worked, renders it very useful in building cellar walls, and all constructions composed of large stones. The boom, A, turns on a centre, and is raised or lowered in a vertical plane, by means of the ropes, C. The boom, with the wheel and pinion, and supports, can be turned in a horizontal direction about the mast, B, so that the stone D, can be placed in any required spot without moving the whole of the machine, as in common derics. A description of the other parts and their mode of action is unnecessary, as they may be understood at once from the drawing.

[For the Mechanic.]

REMARKS ON THE 'UNITING AIR AND WATER WHEEL.'



MESSRS. EDITORS.—It was with some surprise that I saw that long-proved impossibility, 'a perpetual motion,' revived under the name of an 'Uniting Air and Water Wheel,' and published in the Mechanic for January.

I had hoped, that the organ of reflection was so fully developed on the heads of *all* our mechanics, as to banish forever from their minds the idea of inventing or discovering such a machine. But it is evident that I am mistaken,

and it appears that such a result could only be supposed, under the impression, that *all* our mechanics were versed in the first principles of science. In this instance, an ingenious man has spent much time, (if not money,) in calculating and devising a machine which he supposes would generate power, when by a little knowledge of the laws of fluids, he would have seen at one glance, 'that which would retard its operation;' and but little thought would have been required to convince him, that all the mechanical skill, 'good calculation, and the very best of workmanship,' could never produce a revolution of his wheel, by the method which he proposes.

The idea of making a perpetual motion, by causing weights to act with greater power on one side of a wheel than the other, is quite an antique notion, and was substantially refuted by Bishop Wilkins, two hundred years ago; perhaps, however, an illustration, showing the 'plain why and because,' may be of some assistance in our present object. In the drawing above is a wheel of this kind, with eight weights attached to long arms, and suspended on pins at the circumference; on the descending side, a pin checks the descent of the weight, and thus keeps it at the greatest distance from the centre. This certainly has as much the appearance of a revolving self-mover as our friend's 'Water-Wheel;' let us, therefore, discover if we can, the difference of power possessed by the weights on the two sides, which must be calculated from their distance from the centre of the wheel, by tracing the dotted lines from the weights to the figures on the horizontal line, passing through the centre. The different distances will be shown to produce the following results.

On the Ascending Side.			On the Descending Side.		
1st,	2 1-2	25	1st,	7 1-2	25
2d,	8		2d,	10	
3d,	9		3d,	7 1-2	
4th,	5 1-2		4th,	0	

Thus, proving that there is no power whatever in such a combination. As the 'Water Wheel' under consideration, although different in its construction, is precisely the same in principle, it is subject to the same difficulty of being *perpetually at rest*, if dependent on itself for motion.

The inventor inquires if it is not reasonable that the cylinders EFGH, filled with water, will overbalance ABCD, filled with air? We answer, yes; but, the difficulty is, that

the relative situation of water and air in the cylinders, can never be, as represented in the drawing;—that the inventor has left out all idea of pressure, is evident from the cylinder A, being shown filled with air, and the cylinder E, with water; whereas, this is impossible, as the column of water, from the top of the cistern L, to the cylinder A, is so much higher than at E, the piston will be pressed to the bottom of A, and force the air through the pipe to the cylinder E.

It will now be perceived that the cylinders GHA, being filled with water, are, in consequence of their weight, at the bottom of the cistern; and to cause them to move, would require *more* than the power of there similar cylinders of water acting in a contrary direction; likewise, to the cylinders CDE, filled with air, a *greater* power must be applied, to change *them* from their natural position at the top of the cistern L. But, as all the power which can now be produced is in the two cylinders B and F, we cannot reasonably expect the wheel to do better, than remain at rest.

In regard to the lead pistons, it is easily seen that their tendency would be, to turn the wheel in a contrary direction to the projector's anticipations, as the greater number are on the ascending side; being another very tangible cause, 'to retard its operation.'

In conclusion, we would sum up our remarks by stating to the inventor, that after all we have written upon the subject, there is but one difficulty with his machine, viz. to cause the air to remain in the cylinder A, and the water in the cylinder E, as he has represented it in *his* drawing; which, *if* he can effect under the present laws of nature, his end will be accomplished, and his 'newly proposed,' self-moving, 'Water Wheel,' with its leaden pistons, and two gallon cylinders, will revolve with such speed, as will set at nought all the opposing axioms, and demonstrations, from the time of Euclid, to the present.

Boston, Feb. 14th, 1834. JUNIUS.

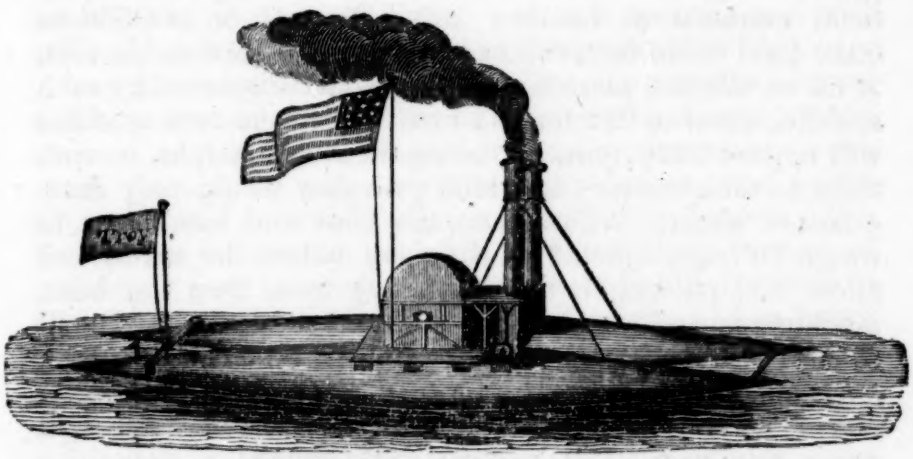
MESSRS. EDITORS.—I noticed in the 'Mechanic' for January, page 12, the drawing of a 'newly proposed Water Wheel,' concerning which, the projector or inventor asks some one 'to point out that which will retard its operation.' For one, I do not think anything will 'retard' its operation, because I do not think it will operate at all.

This wheel, if I understand it, is intended to move wholly under water; hence the cylinders EFG, must be open at

the upper end, to let in the water, the weight of which is supposed to press the air from cylinder E into cylinder A. Now try the scale, What weight of water is there to press upon the piston in cylinder E? Only from the top of the cistern L. What weight is there pressing upon the piston in cylinder A? Answer. The whole column of water from the top of the cistern L. Now suppose the pistons in E and A, to be in the same position as in D and H, or C and G, where would the air escape if it could?—at the top of cylinder E, or at the bottom of cylinder A? Certainly the air would ascend. Why would it? Ans. Because the pressure upward, in cylinder A, is as much greater than the pressure downward in cylinder E, as the column of water is greater from the top of the cistern L. This fact is demonstrated by a diving bell. The lower you sink the bell, the higher the water will rise in the bell, owing to the greater pressure from above. K.

MR. BURDEN'S NEW STEAM BOAT.

In presenting our readers with the following description of this celebrated invention of Mr. Burden, we deem it unnecessary to add anything to the full and clear description here given, which we copy from the New York Mechanics' Magazine.—Eds. Mec.



Our esteemed correspondent, Mr. Blydenburgh, of Lansingburgh, who has had frequent opportunity of witnessing the construction of this boat has forwarded a description of its formation. This description has been submitted

to Mr. Burden, who, after making some trivial alterations, has stated that he has no objection that it should be made public—*that he considers it a correct one:* it is, therefore, subjoined. It is evident that it is capable of performing all that its inventor has promised, and its importance to navigation cannot but be obvious to every one. Mr. Blydenburgh thus writes:

'The principle on which the invention is founded consists in placing two hollow parabolic spindles parallel to each other, at sufficient distance to admit a wheel between them, and by connecting them together by strong timbers across the top, both fore and aft the wheel, in such manner as not only to give the necessary strength, but also to serve as a foundation whereon to erect the necessary superstructure, both for the machinery and for the accommodation of passengers. In his present boat the spindles or trunks are 300 feet long, and 8 feet diameter in the centre, tapering in a regular parabolic curve, to a point at each end. They are placed, as above stated, parallel to each other, and I believe 6 feet inside apart in the clear. The wheel between them is about 30 feet diameter, and 15 feet in length. The buckets are so arranged, as to number and situation, as to prevent the jolting motion felt in the other boats as the buckets strike the water.

To ascertain the buoyancy of this boat, or the burthen she will carry, I take the common method to measure a parabolic spindle—thus: $8 \times 8 \times \cdot7854 = 50\cdot2656$ superficial contents at centre; $300 \times 8 \div 15 \times 50\cdot2656 = 8042\cdot4060$ cubic feet, solid contents, say 8042·5 cubic feet, $\times 62 = 49863\cdot5$ pounds weight of water displaced by each spindle, equal to 222 tons 12 cwt. Then the two spindles will require 222½ tons, including their own weight, to sink them to their centre; in which case they would only draw 4 feet of water. Allow, then, the boat and machinery to weigh 70 tons, which I think is not below the truth, and allow 500 passengers to weigh 37½ tons, then the boat, machinery, and passengers will weigh 107½, and will require 115* tons more to make it draw 4 feet of water.

If the above calculations be true, and they cannot be far out of the way, the boat, with any reasonable load, will never draw over 4 feet, and seldom so much.

With respect to her speed, the time and room will not admit of mathematical calculations, though they could

* Mr. Burden states that from 180 to 200 tons burthen will occasion a draught of 4 feet.

easily be made; and Mr. B. who appears to me to be a man of scientific as well as practical knowledge, has doubtless made them; but I am confident, from her great length, narrow breadth, and light draught, she will equal in her motion the most sanguine expectations. I am confident, that with a little practice to get her waywise, she will make the trip to New York, a distance of 160 miles, and back, allowing a reasonable stop there, not only by sunshine, but an easy day's work.

It has been said she cannot live in rough water. On this point, I have no hesitation in saying that the same weight of materials could not be combined to form a vessel in any other shape with greater, if with equal strength; and one peculiar advantage it possesses over any other steamboat in rough water is, that her whole weight is borne on the outside of her width, while that of other steamboats is in a narrow compass in the middle: while, therefore, the common boat in a rolling sea is liable to overset, or displace her machinery by rolling, and will almost constantly have one wheel out of water, Mr. B.'s boat, standing upon a broad foundation, can roll but little, and the wheel, by being in the middle, will of course maintain an even depth in the water, and the swell not consequently interrupt her speed.

On the whole, from the opinion I entertain of the talents of Mr. Burden, and from what I have seen of his boat, if the invention does not mark a new era in the history of locomotion, as respects rapid and safe travelling, I will willingly submit to be branded as a false prophet.'

Our readers will have observed that the construction of this boat is on a principle that can scarcely be misunderstood by any one. Every person knows that a mass moves more easily through the water endwise than sidewise; and as the editor of the Journal of Commerce very justly observes, 'Mr. Burden has carried the principle to its *ne plus;* instead of building a boat so narrow that she could hardly be made to stand erect, he has made a pair of boats, and so being relieved from all danger of capsizing, he has been able to elongate them to his heart's content.' The rudder, which is placed immediately behind the flag with the word TROY on it, is only a plate of iron about 6 feet long, and about 5 inches wide, and is governed by the motion of a steering wheel, placed parallel with the boiler, on the same trunk to which it is connected by ropes, as will be seen in the engraving;

it is similar to a common steering wheel, and as the chief weight of the parabolic spindles or trunks is in the centre, it causes it to revolve as on a pivot. This may be illustrated by placing a common rolling pin used in making pastry, of the same form, on a table, and turning it; that will form a complete circle, and on that principle, this boat turns, whereas all other vessels turn on their stern.

Fig. 2.

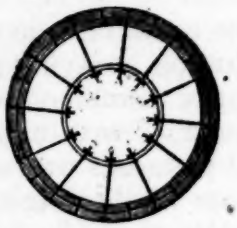


Fig. 2 is a cross section of one of the trunks or spindles; the staves are 26 in number, 3½ inches thick, to each of them is attached an iron bolt, 26 inches in length, passing through the staves, which are countersunk to receive the heads: these bolts are fastened to an iron ring, by nuts, upon the inside; so that the tighter the nuts are screwed, the more compact it makes the staves immediately opposite. Sufficient room is left in the centre for a man to enter and pass fore and aft, to tighten the nuts when necessary.

Fig. 3.

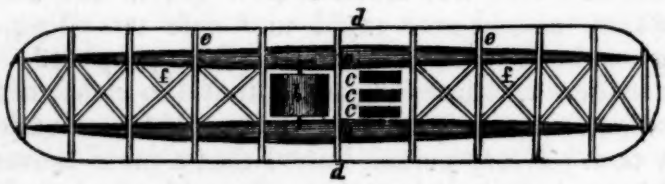


Fig. 3 shows the plan of connecting these two spindles or trunks, upon which the decks are to be built. *aa*, the trunks or spindles; *b*, the water wheel; *ccc*, the boilers; *ee*, the beams which connect it with the outside guard *d*; *ff*, the braces.

We think it right to state another fact in connection with the advantages which we have enumerated; and that is in her complete exemption from jarring or vibration while under way. The passengers in this boat could easily imagine themselves upon terra firma, were it not for her great velocity.

It is, we understand, to be named the EMMA, OF TROY, in respect, on the part of the inventor, to his amiable and intelligent partner for life.

The boilers have been constructed under the direction of Mr. Hall, Engineer of the West Point Foundry, and we have the authority of the editor of the N. Y. Gazette, for saying that 'Dr. Nott stated that he would have no hesitation in placing his cot over the boiler, at all times, and going to sleep with perfect composure, without any dread of danger; and that it was among his happiest reflections, that he had lived long enough to have contributed so much towards the preservation of human life, while so many thousands were enjoying the benefit of steam navigation.'

[For the Mechanic.]

NATIONAL ACADEMY ON PATENTS.

Could there not be some method devised for preventing the great number of *useless* and *ineffectual* patents which are obtained?

I should like to know, if some of your correspondents can tell me, *who* is the judge of the usefulness and practicability of inventions to be patented. Is it left to the judgment of the patentee or his friends whom he may consult?

It seems to me that there should be a National Academy, with power to grant licenses for patents, on account of which, letters patent might be issued by Government. The Academy should be composed of the most distinguished scientific individuals of our country, and they should, as a part of their official duty, examine all petitions and specifications for patents previous to their being made the subject of a patent grant from Government.

I conceive that the influence of such a National Academy upon the scientific interests of our country would be highly beneficial, in concentrating in one point all the scientific information possessed among us, and bringing it to bear upon the completion of specific purposes.

This Academy might consist of delegates from the colleges of our country, meeting at stated periods in some convenient place of session. They might elect members acting and honorary into their own body, give premiums and rewards for the promotion of science, and organize in regular form, general plans for improvement in civil and marine affairs. They should be, however, independent of Governmental control, and should be forbidden to comprise among their members, persons in the service of Government. They should, furthermore, in order that this independence may be complete, be amenable to Government only as private persons, and not in any way in regard to any of their official duties, for the fulfilment of which, they shall alone be responsible to the heads of their own body.

I should be happy to see any improvement to the plan here suggested, or any objections which might be made against it. L.

[From the Journal of the Franklin Institute.]

PATENTS.

SPECIFICATION *of a patent for an improvement in the Cap used as a substitute for Flyers in Danforth's Spinning Machine.* Granted to Joseph Ripka, Manayunk, Philadelphia county, July 31, 1833.

To all whom it may concern, be it known, that I, Joseph Ripka, of Manayunk, in the county of Philadelphia, and state of Pennsylvania, have invented an improvement in the cap used as a substitute for flyers in what is called Danforth's filling frame, and that the following is a full and exact description thereof.

The cap which I use is made in the same general form as that employed by Danforth, but instead of leaving the outside of the cap of a plain continuous surface, I form thereon three or more beads, fillets, or rings, which rise a sixteenth of an inch, more or less, above the general surface of the cap. When I use three only of such rings, I form one of them on the lower end of the conical cap, another on the upper end, just where it begins to curve in towards the spindle, and the third about two-fifths of the distance

between the two former, measuring from the lower edge; the precise situation, however, is not a point of importance.

In the smooth cap, without projecting rims, an attraction or adhesion of the thread to the surface of the cap takes place in certain states of the atmosphere, occasioning great difficulty in the spinning, and a frequent breaking of the thread, which evils are obviated by the projecting rims above described.

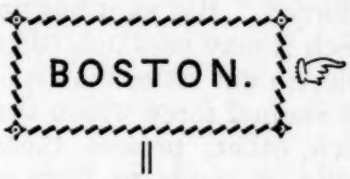
What I claim as my invention, and for which I ask a patent, is the formation of three or more projecting rims upon the cap used in Danforth's spinning machine, in the manner, and for the purposes herein described.

JOSEPH RIPKA.

A. The Cap.
B. Rings, or fillets.

PATENT *for a Traveller's Night and Day Director;* Robert Charles Manners, Boston, Massachusetts, August 13, 1833.

A frame is to be made of any suitable material, cast iron being preferred, which frame is to contain the name, or direction, to any particular place, in solid letters with an open ground. The letters may be cast in one piece with the frame, or attached to it in any convenient way; it is then to be fixed upon a finger or direction post in the usual way. Its appearance will be that of the mark in the margin, supposing the white parts to be removed. A word of this description may, it is said, be read with facility on either side, will be visible in the night, excepting in cases of unusual darkness, and may even then, if necessary, be read with the fingers.



It is proposed to form the names of streets, &c., in the same way, in which case lamp posts may serve not only for their ordinary purpose, but to sustain the name in such a situation as shall admit of its being illuminated.

[For the Mechanic.]

REMARKS ON A CURIOUS FACT.

MESSRS. EDITORS.—In your last number of the Mechanic, I observed an article entitled, '*a curious fact*,' and, to gratify my curiosity, I tried the experiment, the effect of which, I found to be as there stated. My views with regard to the cause of this phenomenon, are as follows: as air is a very elastic fluid, it is susceptible of being compressed so as to occupy a much smaller space, than when in its natural state. And again, it appears evident that when particles of air are forced against other particles, which are comparatively inert, there is a re-action upon the particles forced, as in the instance referred to. The air is forced through the tube against the upper card, and bounds off in every direction. Thus bounding and rebounding between the cards, the particles continually acting and re-acting upon each other, the air becomes compressed into a smaller compass than it would naturally occupy, and tends to form a vacuum; but the atmosphere on the outside presses up the card to supply the place.

But it may be objected, the column of air rushing through the tube, would supply all the vacancy which there is a tendency to produce. It would be so if there were but one way for the air to escape, and that place of the same size as the tube through which it is forced. But as it has no restriction as to the direction in which it may pass out, (that is, horizontally,) it would, if possible, go out faster than it is forced in; while at the same time the actual force which the particles of air receive from each other, presses them together, and passing out so readily, it tends to form a vacuum. It may be seen more obviously, perhaps, by laying the concave card into your hand, or on a table with the concave side up, and placing the other card over it, (say within a fourth or a half of an inch from it,) and then blowing pretty hard, the lower card will rise up, and the harder you blow, the closer it will adhere to the upper card; thus, the harder you blow, the more the particles of air are forced together; and the more the particles of air are forced together, the more condensed it will become, and the more readily will it pass out from between the cards. That the concave card does actually receive a propelling force from the air, which is forced through the tube, is evident from

the fact, that unless the perforated card is tight enough on the tube, both of the cards will go off together. But the surface on which the current of air strikes, is so small in comparison to the surface on which the pressure of the atmosphere acts, that the force which is received through the tube, is counteracted by the pressure of the atmosphere on the outside.

It will be seen from the above remarks, that the conclusion of the whole matter, is this :—The air, by being forced through the tube, is compressed so that it *tends* to form a vacuum, but the outward pressure of the atmosphere forces the card up to supply the place.

Yours, &c. J. E. S.

[For the Mechanic.]

MY NOTE BOOK.—NO. II.

Oil for Machinery.—Pure oil for machinery, is more necessary than mechanics are aware. They are apt to suppose that any substance of a greasy or oily nature is sufficient; and often under this impression, they cause themselves much vexation and loss of time, by using common whale or fish oils on their lathes, engines, dies for cutting screws, and other machinery of a similar character. It may be urged that these oils being much cheaper, their use is an object of economy in large manufactories. We do not know of a greater instance of *false* economy in the whole catalogue of mechanical operations. We do not regard this as a mere theoretical opinion, but as the result of experience, the truth of which we shall attempt to prove by noticing some of the troubles attendant on the use of impure oils, which we doubt not are familiar to almost every person engaged in the use or manufacture of machinery. It is a fact, of the truth of which any one can satisfy himself by trial, that a lathe or engine will run from three to four times longer, after having been oiled with good sperm oil, than when whale or fish oils are used; and therefore, the time saved is more than equal to the increase of cost, without taking into account the injury done to the machine.

In cutting screws, especially on cast steel, or iron, the thread is frequently torn, not on account of being over-strained, but because the oil, by its impurities, causes the screw to bind in the dies to such a degree, that the friction is greater than the metal can sustain. The consequence is, that the workman is often accused of carelessness when he is entirely free from blame. Many other instances could be mentioned in proof of our position, but we believe the above are sufficient, and will therefore offer the following cheap and efficacious remedy.

Method of Cleansing Impure Oils.—Make some strong lime-water by slaking quicklime, and when the lime has settled, pour one quart into a gallon of whale or fish oil, and stir the whole together several times. In a short time, the oil will be found floating on the surface of the lime-water in a state of comparative purity. It can be still farther purified by repeating the process with fresh lime-water. Even sperm oil would be much improved by this treatment.

To Purify Sweet Oil, for philosophical instruments, which will not corrode the metal. Lead, in almost any form, will cure the rancidity of oil, acquired by exposure to the air. It will also destroy the effects of salt on the metal, which is often added to olive oil before transportation, to prevent its becoming rancid. A small quantity of lead or zinc filings, well mixed with the oil, will precipitate the foreign substances. White-lead, being mixed with the oil, would subside, and leave it fine, clear and tasteless. The last method should not be adopted when the oil is likely to be swallowed, as some of the lead may be held in solution, which would make it poisonous to the human system, but which would not injure it for other purposes.

Steer's Opodeldoc, is composed of one ounce of Castile soap dissolved in eight ounces of spirits of wine. Add of camphor, 3 ounces; oil of origanum, 1 drachm; oil of rosemary, half a drachm; solution of ammonia, 6 drachms. Mix them and bottle for use. Heat, age and exposure deteriorate this excellent family medicine.

INTENSE COLD.—A mixture of ice and alcohol has been found to produce such intense cold as to sink the mercury to 40 degrees below zero. Dr. Macculloch (the traveller) being on a high mountain in Scotland, diluted his whiskey with hail which had just fallen. The mixture was instantly covered with ice and frozen to the glass. On trial, the quicksilver in the thermometer sank into the bulb.

INDELIBLE INK FOR PAPER, may be made by adding to a pint of common ink, half an ounce of the black oxide of manganese, and two drachms of indigo. This ink will be very useful for writing deeds, wills and other valuable manuscripts, as it cannot be destroyed by acids, without destroying the paper at the same time.

INDELIBLE INK FOR LINEN, &c.—Put half a drachm of lunar caustic (nitrate of silver) into a small phial of water; add a piece of gum-arabic of the size of a pea, and a little of the paint called sap-green, to make it more legible while writing. When the whole is dissolved, it is fit for use. That part of the cloth to be written on, must be previously wet with a mixture composed of a small quantity of pearl-ash and gum-arabic dissolved in water, and pressed smooth with a hot iron. The writing should be exposed to the sun, which will cause it to dry darker than in the shade.

Boston, March 10th, 1834. JUNIUS.

[For the Mechanic.]

MEANS OF SECURITY FROM THE EFFECTS OF LIGHTNING.

To secure our lives and property from the effects of lightning, we must first become acquainted with the laws by which the electric fluid is governed.

Lightning is a discharge of an extremely subtile fluid through the air, and the thunder which accompanies it, is supposed to be produced by the collapsing of the air in the vacuum created by its swift passage. This fluid is supposed to be universally distributed throughout the earth; but when by the action of heat or other disturbing causes, a

L. of C.

greater portion is lodged in some particular portion of matter, as in a cloud, it endeavors to find its way back to restore the equilibrium by the easiest route. It is a well known fact, first demonstrated by our countryman, Dr. Franklin, that this fluid is identical with the electricity developed by our electric machines. Certain substances conduct the electric fluid *silently* from one place to another, others with difficulty. Now a dry atmosphere is a non-conductor of this fluid; hence the lightning, in passing from the clouds to the earth, is obliged to force its way through it with violent effort. Vegetables and the human body are more perfect conductors; so that the lightning seizes upon these whenever it can, to expedite its passage. Hence the reason why trees, animals and human beings are so frequently struck. But *metals* are still more perfect conductors, whence we see the reason of using metallic rods to conduct the lightning down a building, without its entering and doing damage, by forcing its way through less perfect conductors.

Copper of all metals is the best conductor, besides being less liable to rust than iron, and hence preferable to that, inasmuch as that the metals, when they become rusty, are non-conductors, and useless for the purpose of conducting rods.

I would recommend that the conductor should be made of copper, half round, with the round side next the wall or building; and at the upper extremity, there should be four points, made as acute as possible. Every projection or corner should have a pointed rod, at least two feet in length, which should be connected with the main rod by smaller bars of the same metal. The rod should be carried the shortest way to the ground, and if the building be more than thirty feet high, several points, three inches in length, should be welded on the conductors that run down the sides of the building. The rods may be fastened to the building by cleats of wood. They should enter the earth at the bottom, and should be continued down to a stratum of permanently moist earth, with the ends well pointed.

To protect the person from the effects of lightning, we should divest ourselves of all metal ornaments, and sit in the middle of a room with the doors and windows shut; thus enveloping ourselves in a dry, non-conducting atmosphere. A fire is dangerous, because the smoke serves as a conductor to attract the lightning. Avoid being agitated,

which renders the breath very damp and gives it conducting powers. Shelter should not be taken under trees, but we should rather keep at a distance from elevated objects. Barns or other places containing vegetable substances should also be avoided, as the effluvium of such substances attracts the electric fluid. G. W. B.

Boston, March 1st, 1834.

HE IS SHUT UP.

Then he is either unfortunate, and ought to be pitied; unskilled in business, and will profit by the lesson; or a rogue, and never ought to run at large. He has certainly one solace. Misery loves company; he has enough: in New York, in Boston, in almost every seaport, and in the country, are numbers of this monastic order, who, secluded from the world, are devoutly praying for the forgiveness of their debts.

'I told you so,' says common sense. You were forewarned of all this difficulty. Money was plenty; business was going on briskly; it was easy getting credit; a man might trade upon six times his real capital. You were swimming with the tide at a great rate; a clear sky and pleasant gale gave speed to the course. The Scylla and Charybdis of British amity and French fraternity were unheeded; you little thought you should run upon both.

You were living high, making entertainments, and going to the theatres. Apropos the road to poverty, like that to Avernus, is descending, smooth and easy: but, it is a tight job to ascend. The boy, who slides down hill, has to tug hard to draw his sled up again.

Probably you have a family to add weight to the load; if your wife and children have been accustomed to ride on the paved streets or smooth road, they will hardly be willing to quit the carriage and walk up hill on foot, much less to lend a hand or shoulder to the wheel.

But why describe a disease, without pointing out a remedy? If your case is not desperate, I will prescribe the best I can. Look over your books, count your cash; if you have wherewithal, pay your creditors, like an honest man; if not, compound with them as well as possible. There are

no different degrees of debts here as in England. I will recommend one distinction; let the faithful servant, the honest laborer, and industrious mechanic, have what is the king's right there; pay them first. Industry is of more consequence to a nation than a king, and should always have its earnings.

Change your domestic economy. Remember the world was not made to be crammed into one man's purse, but for the common support of its inhabitants. Be content to jog along with your brethren. Rent part of your house; send your plate to the mint and exchange it for money; put out your sons apprentices to some good trade, or settle them on a snug farm in the country, if they are in no better employment. Let your daughter sell her harpsichord and her gold watch: instead of going to the dancing school, let her teach her neighbors' children the use of the needle, if she has learned it herself; if not, it is time to begin. The habit of honest industry is the best portion in the world; it is an annuity for life; much better for society and for your children than a thousand a year.

MISCELLANY.

[For the Mechanic.]

THE QUADRATURE OF THE CIRCLE.—Mr. G. H. Thompson, of this city, has been engaged for several years in making calculations on this subject, which he thinks will be beneficial. Having, as he supposes, discovered the true quadrature of the circle, and taking this for his foundation, he is building up a new system.

I have been in his room several times within the last five years, and have found him generally engaged on the same thing. He informed me three years ago, that he was making a 'spherical log,' that is, a table of 'spherical logarithms,' which he was so anxious to complete, that he refused to make any engagements which would divert him from this work.

Mr. Thompson always appeared very much in earnest on this subject, and he has certainly pursued it with a great deal of patience and perseverance. From his general courtesy and suavity of manners, I was surprised that any one should treat him with disrespect; which I think

has been done by a correspondent over the signature of 'S,' in No. 2 of the 'Scientific Tracts.' Let him speak for himself. He says, 'We have never seen a man who could take a round ball, and so chip it off on four sides as to make a square block, and have nothing left.' Most men would have thought it necessary to 'chip it off' on six sides to make a square, or more properly a cubical block; but this may be a slip of the pen. Again, he says: 'The squaring of the circle, whenever accomplished, will consist, in reality, in turning a cube into a ball, or a ball into a cube, whose sides will be exactly alike, as it respects the external superficies, without any loss of matter by the transformation.' I must say, that Mr. S. is wrong in the above statement. We may conceive of a solid body in the form of a cube, containing a certain quantity of matter, and occupying a certain portion of space; and also, of a solid body in the form of a globe, containing an equal quantity of matter, and occupying an equal portion of space with the cube; but it is out of character to say that their external superficies would be equal. Ask any man of common sense, which of two loaves of bread of equal weight, would have the most crust, the round one, or the square one? Why does a bladder, or a soap-bubble assume a round form in preference to a square one? Because the globe is the most capacious of all bodies, or will contain a greater quantity of matter than any other body having an equal quantity of external surface. After several other remarks, equally wise but more ridiculous, Mr. S. concludes by inviting Mr. Thompson to furnish an article from his own pen for the next number of the 'Tracts.'

In No. 5 of the 'Tracts,' I find an article on this subject from the Green Mountain State, which is written in good humor, but I am afraid Mr. S. will not be edified by its perusal; and among the notices to correspondents, is the following:—'Mr. Thompson's paper cannot be inserted with propriety.' Would it not have been proper to inform us why the article of Mr. T. could not be inserted: was it improper in itself, or was it expected that the man could give his ideas on the subject without algebraic characters and geometrical diagrams?

I profess myself to be the champion of genius, especially neglected genius; and I must say, that a man who will make a prisoner of himself, as it were, for years, in maturing a project which he verily believes will be of the greatest benefit to mankind, whether he is in error or not, ought to be treated at least with candor; nay, he ought to be encouraged in bringing forth his project. If Mr. Thompson's ideas were published in a full and clear manner, those who were capable of examining the work, might be induced to look at it in their closet, although they might object to a public

examination; and if errors were discovered, they might be pointed out in our public journals, or by writing directly to the author.

In conclusion, I should be sorry to see the talented editor of the 'Tracts and Lyceum' permitting his correspondents to ridicule any man, without allowing him to vindicate himself, or giving a candid statement of the reasons for rejecting his reply. PHILO.

QUADRATURE OF THE CIRCLE.—Messrs. Editors: Having observed in your January number of the Mechanic, an article entitled, 'Mechanical Quadrature of the Circle,' I was induced to examine a little into it.

Mathematicians have determined the ratio of the diameter and circumference of a circle to be *about* as 1 to 3·1416, and some have had the patience to carry out the calculation to some hundreds of places of decimals; and it has been sufficiently shown, that the true ratio can only be expressed by an *infinite series*. The ratio 1 to 3·1416 is exact within one ten thousandth, which is as great a degree of accuracy as is needed in most calculations.

In the mechanical solution, the diameter of the circle was one inch and nine tenths, and the square one inch and seven tenths. The area of the square, found by squaring its diameter, is 2·89, or two inches and eighty-nine hundredths. The area of the circle is found as follows:—The given diameter 1·9 is multiplied by 3·1416, its ratio to the circumference, which gives for a product 5·969, equal to the circumference of the circle. The radius or half diameter is ·95, or ninety-five hundredths of an inch: I multiply the circumference by this, which gives 5·67, the double area of the circle, one half of which is 2·835. Placing the area of the circle and square under each other, and subtracting, we have ·055, 55 thousandths, or nearly 6 hundredths of an inch difference; hence the mechanical process is exact only to tenths, while the ratio mathematically obtained can be carried with perfect exactness to any number of decimal figures required in the most nice calculations.

O. S.

MECHANICS' LYCEUM.—This society have just completed their fourth course of exercises, consisting of the following lectures. Introductory, Painting, Geometry and Arithmetic, Silkworm and Cultivation of Silk, Astronomy, Properties of Matter, Electricity, Electricity and Galvanism; besides debates, declamations and extemporaneous speaking. All the exercises are conducted by the members, on the mutual instruction principle. The officers for the ensuing year are, T. Claxton, President; Joseph M. Wightman, Treasurer; Geo. D. Miles, Secretary; Geo. P. Oakes and John P. Farmer, Curators. A committee consisting of Messrs. A. H. Wood, Samuel Bailey, John F. Locke, B. F. Horton and G. W.

Beck, was appointed to solicit candidates for membership the next season. The exercises of this Society, the past season, have been conducted with that spirit and harmony which only can exist among generous hearts and cultivated minds.

Mechanic Apprentices' Library Association.—This institution, which for usefulness is not surpassed by any other in the city, having under its control a large library of useful books, a cabinet of natural history, together with a reading room, and pursuing, as they do, a system of mutual improvement among their members, is entitled to the cordial support of every mechanic's apprentice in the city, and to the favors of our wealthy citizens. It has just closed its course of Exercises for the season, which consisted of lectures by the members, debates, elocution, &c.

The fourteenth anniversary of the institution of the library was celebrated by the Society on the 22d of February, at Chauncey Hall, on which occasion an address was delivered by a member. A class of elocution is about to be organized, to instruct such members as are desirous of improvement during the intervals between the regular courses of exercises. The library room is at No. 3, Cornhill, under the publication office of the Mechanic. The extremely low price of admission to its benefits, (one dollar per year,) places it within the reach of every apprentice in the city.

Steam Rice Mill.—John Prince, Esq. of Boston, has put into operation a set of Patent Mills for hulling and cleaning rice, near the Free Bridge, South Boston. The mills are carried by a steam-engine, of about eighteen horse power. The rice hulled at these mills is pronounced by judges to be of good quality, and has the advantage of being fresher than that which is hulled at the place of culture.

New Invention.—The editor of the American Farmer says that a man in Connecticut has found a way to warm his factory to any desirable extent without fuel—but by means of heat produced by the friction of iron cylinders, which are moved by the power which *actuates* the factory, and the rarified air is carried to any part of the building through pipes. This is indeed something new.

Mechanics in China.—It is said there are in China, 25,000 shoemakers; 15,000 weavers; 16,000 carpenters and cabinet makers; and 7,000 lapidaries, or cutters of precious stones.

How Philosophers are made.—The self-taught American philosopher Rittenhouse, being, when a young man, employed as an agricultural laborer, used to draw geometrical diagrams on his plough, and study them as he turned up the furrow.

The Porcelain Tower of Nankin.—It is used as a temple of idolatrous worship; therefore it is called a *Pagoda.* It is 200 feet high, and 40 square. It is lined and covered with Chinese tiles, and is indeed a very magnificent object.

An Organ, 40 feet wide and 45 feet high, has been constructed in England. The largest metal pipe will be 5 feet 3 inches in circumference, and 35 feet high.

A cubic inch of lead is forty times heavier than the same bulk of cork.—Mercury is nearly fourteen times heavier than the same bulk of water.

To Correspondents.—The article on mathematical quantities, and several answers to questions, are deferred to our next number.

QUESTIONS.

1. Required the side of the greatest equilateral triangle that can be inscribed in a circle whose diameter is 12 inches?

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2. Can it be demonstrated, that if the three sides of any triangle be bisected, and from the point of bisection, straight lines be drawn to the vertices of the opposite angles, the three lines will meet in a point within the triangle, and the point will be in each of said lines, twice as far from the vertex as from the side from which it is drawn?

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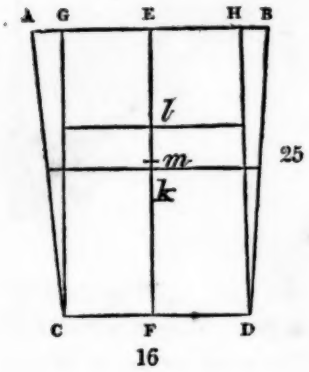
3. Three masons, A, B and C, build a wall. A and B jointly, could build it in 12 days; B and C, could build it in 20 days; and A and C, in 18 days. What time would it take each alone to do it—and what would be required to complete it if they all worked together?

ANSWER.



MESSRS EDITORS:—I believe your correspondent 'Philo' is mistaken, (as he has probably himself discovered by this time,) respecting the pressure upon a gate wider at the top than at the bottom. The rule for ascertaining the pressure upon any surface is, to multiply its area by the depth of its centre of gravity from the surface of the water. I find the centre of gravity of the gate ABCD, as follows.

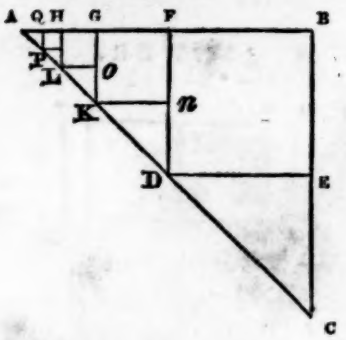
Divide equally AB and CD, in E and F, and join EF. *k*, the centre of EF, will be the centre of gravity of the parallelogram GCDH. The centre of gravity of the two triangles will also be in EF, at a point which is one third of the distance between the sides AG, HB, and their opposite angles. Let this point be *l*. The centre of gravity of the whole body then is a point in *k l*, whose distance from *k* multiplied by the parallelogram, will equal its distance from *l* multiplied by the two triangles. If the parallelogram is 16 by 25 feet, and the triangles 2 feet each at the top, they will be to each other as 400 to 50, or 8 to 1. If we divide *k l*, then, into 9 equal parts, the centre of gravity *m*, will be the distance of one of those parts from *k*. But *k l* is 1-6 of EF, and *k m* 1-9 of *k l*; *k m* is therefore 1-54 of 25, = ·463. Deduct this from 12·5, it gives 12·037 for the depth of the centre of gravity by our rule.

Area of gate, 450, × depth of centre of gravity, 12·037, × weight of a cubic foot of water, 62·5 = 338541.

The pressure on the gate 18 by 25 ft.=	351562
Deduct	338541
	13021 lbs. difference.

This result may be proved as follows:

'Philo' has very ingeniously demonstrated that upon a right triangle placed perpendicularly under water with the vertex down, the pressure below the centre is equal to the pressure above it. Now if we can find the pressure on the upper portion the problem is solved. To this we may approximate within a small fraction.



Construct the triangle ABC. Bisect BC in E, and draw ED DF. Bisect DF and draw *n*K, KG. Bisect KG and draw *o*L LH, &c. The pressure upon the surface ADEB = press. parallelogram DB + pressure triangle ADF. But the pressure on ADF is 1-4 the pressure on DB + 2 press. AGK. For pressure ADF = 2 press. AK*n*F = 2 press. (KF + AGK.) But press. KF = $\frac{\text{pr ess. DB}}{8}$. Press. ADF then = $\frac{\text{press. DB}}{4}$ + 2 press. AGK. In like manner, it may be proved that press. AGK = $\frac{\text{press. KF}}{4}$ + 2 press. AHL; and 2 press. AGK, = $\frac{\text{press. KF}}{2}$ or $\frac{\text{press. DB}}{16}$ + 4 press. AHL.

This process may be carried on to infinity, but the steps we have taken are sufficient to show that we are continually approximating the pressure upon ADEB. We have already obtained press. ADEB = press. DB + $\frac{\text{DB}}{4}$ + $\frac{\text{DB}}{16}$ + 4 press. AHL. Going a step farther we have 4 press. AHL = $\frac{\text{press. DB}}{64}$ + 8 press. APQ.

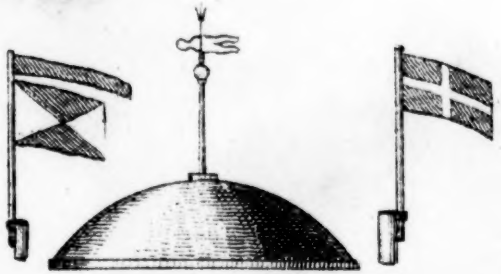
Let us appy this rule to the pressure upon the triangular part of the gate. Taking the two triangles together, we have above the centre the pressure upon a parallelogram 2 feet by 12·5 = 9765·6 lbs. + $\frac{1}{4}$ + $\frac{1}{16}$ + $\frac{1}{64}$ + $\frac{1}{256}$ + $\frac{1}{1024}$ &c.

	9765·6
4	2441·4
16	610·3
64	152·5
256	38·1
1024	9·5
4096	2·3
16384	·5
65536	·1
	13020·3 press. on upper portion of triangle.

Whole pressure on triangle, 13020·3 × 2 =	26040·6
Pressure on parallelogram, 25 by 16	312500
" " whole gate,	338540·6

C.

UNIVERSAL MARINE TELEGRAPH.



OBSERVATORY

28 CENTRAL WHARF

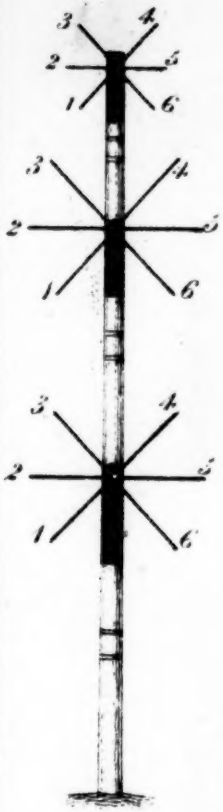
CONVERSATION

FLAG

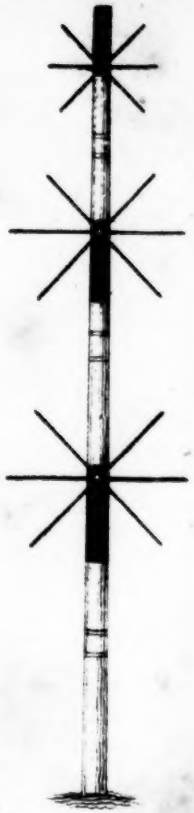
NUMERICAL FLAGS.

Pendleton's Lithography, Boston.

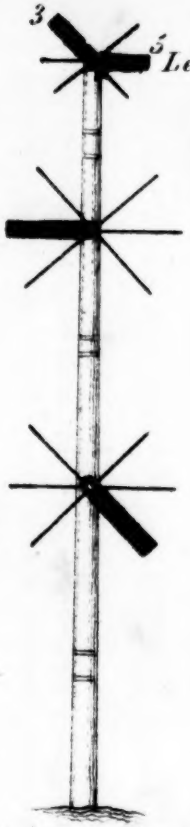
J. R. PARKER'S SEMAPHORIC TELEGRAPH.



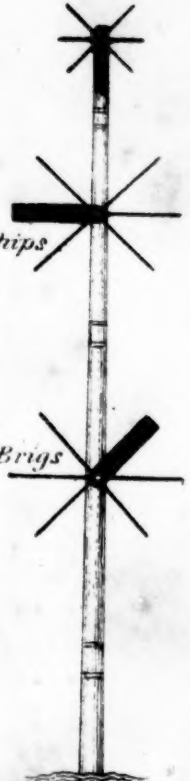
At rest



Signal for conversation.



What is her Name



Signalizing.

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